

THE CLAIMS

What is claimed is:

1. A concrete material comprising:
an elastomeric polymer in an amount sufficient to provide flexibility to the resultant material;
a cement that has low shrinkage and expansion properties;
a silicone resin in an amount sufficient to improve adhesion between the elastomeric polymer and the cement;
a filler; and
water in an amount sufficient to cure the cement and form the concrete material;
wherein the polymer fills at least some of the pores in the material and helps the polymer bond the filler to the cement.
2. The concrete material of claim 1 wherein the elastomeric polymer is one that is in liquid form and that is reactive with the cement or water that is included in the material, and is present in an amount of about 4 to 14 percent by weight based on the weight of the material.
3. The concrete material of claim 2 wherein the elastomeric polymer is a polysulfide polymer or a polyurethane polymer and sufficient pores are filled with the polymer so that material has a porosity of between 2 and 20%.
4. The concrete material of claim 1 wherein the cement has an expansion rate of less than about 0.5% and is an alumina, sulfoalumina, or sulfoferritic cement and is present in an amount of about 4 to 17 percent by weight based on the weight of the material.

5. The concrete material of claim 1 wherein the silicone resin is present in an amount about 0.1 to 1 percent by weight based on the weight of the material.

6. The concrete material of claim 1 wherein the filler comprises sand and is present in an amount of about 60 to 91 percent by weight based on the weight of the material.

7. The concrete material of claim 1 which further comprises a curing agent for the elastomeric polymer in an amount of between about 0.1 and 0.5 percent by weight based on the weight of the material.

8. The concrete material of claim 7 wherein the curing agent is a bichromate of an alkali or alkaline earth metal, alone or in combination with at least one transition metal oxide.

9. The concrete material of claim 1 wherein the water is present in an amount sufficient to provide a water to cement weight ratio of about 0.05 and 0.1.

10. A concrete material property improving additive comprising a polymer admixture comprising an elastomeric polymer, a silicone resin and at least one solvent in an amount sufficient to form a viscous flowable mass of the admixture.

11. The additive of claim 10 wherein the elastomeric polymer is present in the admixture in an amount between about 70 to 98% by weight while the silicone resin is present in the admixture in an amount of about 2 to 30%.

12. The additive of claim 10 wherein the solvent comprises a mixture of aromatic and aliphatic solvents, and the admixture has a temperature of between about 30°C to 60°C.

13. A concrete material comprising a cement component and the additive of claim 10 in an amount sufficient to improve the flexibility of the cement component; wherein the polymer fills at least some of the pores in the material and at least partially bonds the filler to the cement.

14. The concrete material of claim 13 wherein the cement component is an alumina, sulfoalumina, or sulfoferritic cement.

15. The concrete material of claim 13 wherein the cement component is present in an amount of about 40 to 50 percent by weight and the concrete material further comprises a filler in an amount of about 30 to 45 percent by weight.

16. The concrete material of claim 15 wherein the filler comprises sand and the cement component further comprises water in an amount of about 1 and 25% by weight.

17. A method of forming a concrete material which comprises preparing a mixture of the additive of claim 10 with a cement that has low shrinkage and expansion properties, a filler, and water in an amount sufficient to cure the cement; and curing the mixture to form the concrete material.

18. The method of claim 17 which further comprises including a curing agent for the polymer to assist in curing of the mixture.

19. The method of claim 18 wherein the curing agent is present in an amount of between about 0.1 and 0.5 and preferably between about 0.2 and 0.3 percent by weight based on the weight of the material, and is a bichromate of an alkali or alkaline earth metal, alone or in combination with at least one transition metal oxide.

20. The concrete material provided by the method of claim 17.

21. A method of repairing a crack or fracture in a concrete or cement surface which comprises cleaning surfaces of the crack or fracture to remove loose material and to create a cavity, applying the concrete material of claim 1 under pressure into the cavity, and allowing the concrete material to cure to repair the crack or fracture.

22. The method of claim 21 wherein the pressure applied to the concrete material is at least about 400 Kg/cm².

23. The method of claim 21 which further comprises applying a primer to the cleaned surfaces of the cavity before applying the concrete material into the cavity.

24. The method of claim 23 wherein the primer is a polysulfide material and is applied in an amount sufficient to enhance the bonding of the concrete material to the surfaces of the cavity.

25. The repaired crack or fracture in a concrete or cement surface which is obtained from the method of claim 21.